

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Data Requirement:

PMRA DATA CODE

EPA DP Barcode

OECD Data Point

EPA MRID

42867902

EPA Guideline

OPP §71-4b

Test material:

Metaldehyde Technical

Purity: 99%

Common name:

Metaldehyde

Chemical name:

IUPAC: Not reported

CAS name: Not reported

CAS No.: 9002-91-2

Synonyms: None reported

Primary Reviewer: Christie E. Padova

Staff Scientist, Dynamac Corporation

Signature: *C.E. Padova***Date:** 1/4/05**QC Reviewer:** Teri Myers

Staff Scientist, Dynamac Corporation

Signature: *Teri Myers***Date:** 1/20/05**Primary Reviewer:** Colleen Flaherty

OPP/EFED/ERB - III

Date: *Colleen M Flaherty**07 Feb 05***Secondary Reviewer(s):**

{EPA/OECD/PMRA}

Date:**Reference/Submission No.:****Company Code:****Active Code:****EPA PC Code:** 053001**Date Evaluation Completed:**

CITATION: Beavers, J.B., and K.A. Hoxter, and M. Jaber. 1993. A Reproduction Study with Metaldehyde in the Mallard. Unpublished study performed by Wildlife International Ltd., Easton, MD. Laboratory Project No. 289-107. Study submitted by Lonza Inc., Fair Lawn, NJ. Study initiated April 1, 1992, and submitted August 3, 1993.



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EXECUTIVE SUMMARY:

The one-generation reproductive toxicity of Metaldehyde Technical to groups (16 pens/treatment level) of 1 male and 1 female, 19-week-old Mallard duck was assessed over approximately 22 weeks. Metaldehyde Technical was administered to the birds in the diet at nominal concentrations of 0 (negative control), 50, 175, and 500 ppm. Mean-measured concentrations were <LOD (control), 49, 176, and 497 ppm a.i., respectively.

There were no significant treatment-related effects on adult mortality, body weight, or feed consumption at any test level. However, three hens from the 497 ppm a.i. level exhibited convulsive behavior during washing procedures. Episodes occurred in single birds during Weeks 12, 19, and 20. In all cases, the hens appeared to recover completely within 15 minutes of the episode and the clinical signs did not re-occur. The LOAEC for clinical signs of toxicity in adult birds was 497 ppm a.i. Although not conclusive as related to treatment, the incidence of the numbers of regressing/regressed ovaries observed upon necropsy of hens totaled 7/15, 11/16, 10/15, and 14/16 for the control, 49, 176, and 497 ppm levels, respectively.

The reviewer's analysis detected significant reductions in the ratios of number hatched to eggs laid, to eggs set, and to live embryos at all treatment levels, as well as in the ratio of hatchling survival to eggs set at the lowest treatment level. As a result, the NOAEC for these reproductive endpoints could not be determined (<49 ppm). At the measured 497 ppm level, treatment-related effects were observed on eggs set, number hatched, hatchling survival, and the ratio of hatchling survival to number hatched.

No overt signs of toxicity were observed in hatchlings from the control, 49, or 176 ppm levels, and no treatment-related effect on offspring body weights were observed at any treatment level. Offspring from the 497 ppm level displayed profound clinical signs that appeared to be treatment related. In general, up to approximately one-third of the offspring hatched in any given week displayed dorsal or ventral neck curl, and circling behavior. Furthermore, the ducklings from this level appeared more excitable and disoriented than normal offspring. In a number of cases, the ducklings that survived appeared to improve as they matured. The LOAEC for effects on reproduction was 497 ppm.

This study is scientifically sound, but it does not fulfill the guideline requirements for a reproductive toxicity study with mallard duck (§71-4b) because a NOAEC could not be identified. As a result, this study is classified as Supplemental.

Results Synopsis

Test Organism Size/Age: 19 weeks old at test initiation (955 -1430 g)

NOAEC: <49 ppm a.i.

LOAEC: 49 ppm a.i.

Endpoint(s) Affected: Clinical signs of toxicity (adults and offspring), eggs set, number hatched, ratio of number hatched to eggs laid, number hatched to eggs set, number hatched to live embryos, hatchling survival, ratio of hatchling survival to eggs set, and hatchling survival to number hatched.

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: The study protocol was based on procedures of the U.S. EPA Pesticide Assessment Guidelines, §71-4 (1982). Deviations from §71-4 are:

1. Mortality of the Mallard during acclimation was not reported.
2. Since effects on reproduction were observed, a withdrawal period should have been conducted.
3. The LOD/LOQ for the analytical method was not reported.
4. The expected field residue level was not reported.
5. The average egg storage temperature (prior to setting for incubation) was 14.2°C, slightly lower than the recommended level of 16°C.
6. A NOAEC was not identified in this study because significant effects on reproduction were detected at the lowest treatment level.

Failure to detect a NOAEC affected the acceptability of the study; the study is classified as supplemental.

COMPLIANCE: Signed and dated GLP, Quality Assurance, and Data Confidentiality statements were provided. This study was conducted in accordance with United States, OECD, and Japan MAFF GLP standards, with the following exceptions: the physical and chemical characterization of the test substance was not performed at the laboratory, and was considered the responsibility of the sponsor; periodic analysis of basal diet and water for background concentrations of selected organic and inorganic substances were not fully conducted in compliance with GLP standards; there were two instances during the conduct of the study where a daily balance check was not properly documented. Historical data for this balance indicated that these two occurrences had no scientific impact on the study.

A. MATERIALS:

1. Test Material Metaldehyde Technical

Description: Off-white powder

Lot No./Batch No.: 5448

Purity: 99%

Stability of Compound

Under Test Conditions: The stability of Metaldehyde Technical in the treated feed was assessed during the pilot study in treated feed prepared at 300, 1000, and 2000 ppm and stored in open metal bird feeders under ambient conditions for 10 days. Initial (Day 0) recoveries ranged from 100.6 to 105.5% of nominal concentrations, and final (Day 10) recoveries ranged from 97.8 to 105.2% of nominal concentrations.

**Storage conditions
of test chemical:**

The test substance was transferred from the shipping containers into perforated cardboard containers lined with plastic, to allow for air circulation throughout the containers. The containers were covered, and stored refrigerated at approximately 5°C. These procedures were performed in order to allow for the release of any acetaldehyde that may be formed during the degradation of metaldehyde, as acetaldehyde is considered a catalyst for further degradation.

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**Stability of Compound
(Neat) Under**

Storage conditions: The storage stability of Metaldehyde Technical (neat) was assessed periodically from receipt (10/91) to the end of the definitive study (9/92) using gas chromatography. Recoveries were $\geq 99.60\%$ metaldehyde and $\leq 0.40\%$ acetaldehyde for all samples.

OECD requires water solubility, stability in water and light, pK_a , P_{ow} , and vapor pressure of the test compound. The following OECD requirements were reported:

Aqueous solubility: Approx. 300 ppm (temperature not specified)

2. Test organism:

Table 1: Test organism.

Parameter	Details	Remarks
		Criteria
Species (common and scientific names):	Mallard duck (<i>Anas platyrhynchos</i>)	EPA: a wild waterfowl species, preferably <i>Anas platyrhynchos</i> , or an upland game species, preferably <i>Colinus virginianus</i> .
Age at Study Initiation:	19 weeks	Birds were reportedly approaching their first breeding season. EPA requires: birds should be approaching their first breeding season.
Body Weight: (mean and range)	Males: Overall range (n=64) 1024 to 1430 g, with group means of 1216 to 1235 g. Females: Overall range (n=64) 955 to 1280 g, with group means of 1064 to 1087 g.	Individual body weights were recorded at Weeks 0, 2, 4, 6, 8 and 22 (test termination). EPA: body weights should be recorded at test initiation and at biweekly intervals up to week 8 or up to the onset of egg laying and at termination.
Source:	Whistling Wings, Inc. Hanover, IL	Birds were from the same hatch, and were phenotypically indistinguishable from wild birds. EPA : that all birds should be from the same source.

B. STUDY DESIGN:

1. Experimental Conditions

a. Range-finding Study - A 6-week pilot study was conducted with an unspecified number of adult Mallard at nominal dietary concentrations of 300, 1000, and 2000 ppm. Three birds from the 1000 ppm group and all birds from the 2000 ppm group died prior to study termination. In addition, there were decreases in body weight and feed consumption at 2000 ppm, and decreases in egg production at the 1000 and 2000 ppm levels.

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b. Definitive Study

Table 2: Experimental Parameters.

Parameter	Details	Remarks
		Criteria
Acclimation period:	3 weeks	At test initiation, all birds were examined for physical injuries and general health, and birds that did not appear healthy were excluded from the study. Ducks were fed a basal game-bird diet formulated by Agway Inc., to meet laboratory specifications, and provided public tap water from Easton, MD. EPA: 2-3 week health observation period prior to selection; birds must be generally healthy without excess mortality; feeding should be <u>ad libitum</u> ; sickness, injuries or mortality be noted.
Conditions (same as test or not):	Same as test	
Feeding:	Water and feed were provided <i>ad libitum</i> .	
Health (any mortality observed):	Pre-test mortality was not reported.	
Test duration pre-laying exposure:	Approximately 10 weeks	Reproductive effects were observed; a withdrawal period should have been conducted.
egg-laying exposure:	Approximately 12 weeks	EPA requires <u>Pre-laying exposure duration:</u> ≥ 10 weeks prior to the onset of egg-laying. <u>Exposure duration with egg-laying:</u> ≥ 10 weeks. <u>Withdrawal period:</u> If reduced reproduction is evident; ≤ 3 weeks added to the test phase.
withdrawal period, if used:	None	
Pens size:	Parents (one pair) were housed in battery breeding cages measuring 75 x 90 x 45 cm. Offspring (by set and group) were housed in 62 x 92 x 25.5 cm battery brooders.	<u>Pens</u> Adequate room and arranged to prevent cross contamination <u>Materials</u> Nontoxic material and nonbinding material, such as galvanized steel. <u>Number</u> At least 5 replicate pens are required for mallards housed in groups of 7. For other arrangements, at least 12 pens are required, but considerably more may be needed if birds are kept in pairs. Chicks are to be housed according to parental grouping.
construction materials:	Parental pens were constructed of vinyl-coated wire mesh. Offspring pens were constructed of vinyl-coated wire mesh and stainless steel sheeting.	
number:	16 parental pens/treatment level	
Number of birds per pen (male:female)	2 birds/pen (1 male:1 female)	EPA: 1 male and 1 female per pen. For ducks, 2 males and 5 females is acceptable.

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Parameter	Details	Remarks
		Criteria
# Pens/treatment negative control: solvent control: treated:	16 pens N/A 16 pens/treatment	<i>EPA requires at least 12 pens, but considerably more if birds are kept in pairs. At least 16 is strongly recommended.</i>
Test concentrations (ppm diet) nominal: measured:	0 (negative control), 50, 175, and 500 ppm <LOD (control), 49, 176, and 497 ppm a.i. (reviewer-calculated)	Samples used for concentration verification analyses were collected from freshly-prepared diets prior to study Weeks 1, 2, 3, 4, 8, 12, 16, 20, and 21; recoveries from 91.4 to 112.6% nominal; LOD/LOQ not reported; concentrations of test substance in diet not adjusted for purity <i>EPA: ≥ 2 concentrations other than the control are required; three or more are recommended</i>
Maximum labeled field residue anticipated and source of information:	Not specified	<i>EPA : highest test concentrations should show a significant effect or be at or above the actual or expected field residue level.</i>
Solvent/vehicle	None used	<i>EPA requires corn oil or other appropriate vehicle not more than 2% of diet by weight</i>
Was detailed description and nutrient analysis of the basal diet provided? (Yes/No)	Yes	Basal diets contained ≥27% protein, ≥2.5% fat, ≤5% fiber, and 5% limestone. Offspring received basal diet test substance or limestone. <i>EPA requires a commercial breeder feed (or its equivalent) that is appropriate for the test species.</i>

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Parameter	Details	Remarks	
		Criteria	
Preparation of test diet	Test substance was combined directly with a small portion of basal ration, mixed using Waring blender, quantitatively transferred with basal ration as the rinsing agent to a Hobart mixer containing additional basal feed. Remaining ration was added and mixed for 20 minutes. Separate pre-mixes were prepared for each concentration level every 4 weeks; stored frozen until needed. Final diets were prepared weekly. Portions of pre-mix were combined with additional basal ration and limestone, mixed for 20 minutes in a Patterson-Kelly Twin Shell blender prior to offering.	No solvents or carriers were used in diet preparation.	<i>A premixed containing the test substance should be mechanically mixed with basal diet. If an evaporative vehicle is used, it must be completely evaporated prior to feeding.</i>
Stable and homogeneous?	Yes		
Were concentrations in diet verified by chemical analysis?	Yes	Samples were analyzed from feed prepared during Weeks 1, 2, 3, 4, 8, 12, 16, 20, and 21. Recoveries for all toxicant levels ranged from 91.4-112.6% of nominal concentrations.	
Did chemical analysis confirm that diet was stable?	Yes	Stability was assessed during the pilot study in treated feed prepared at 300, 1000, and 2000 ppm and stored in open metal bird feeders under ambient conditions for 10 days. Initial (Day 0) recoveries 100.6-105.5% nominal; final (Day 10) recoveries 97.8-105.2% of nominal concentrations. Details of the analytical method were not provided.	
Homogeneous?	Yes	Homogeneity was assessed in treated feed prepared on Day 0 of Week 1 at 50 and 500 ppm treatments. Six samples per level were collected: 1/side from the top, middle, and bottom of batch. Calculated CVs were 5.8% at 50 ppm and 6.0% at the 500 ppm	
Feeding and husbandry	Feeding/husbandry conditions appeared to be adequate		

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Parameter	Details	Remarks	
		Criteria	
Test conditions (pre-laying) temperature:	20.9 ± 1.7°C	Light intensity averaged 365 lux. Illumination was provided by fluorescent lights which closely approximated noon-day sunlight.	
relative humidity:	71 ± 17%		
photo-period:	8 hr light/day up through Week 8; 17 hr light/day thereafter.	EPA Requires Temperature: About 21°C (70°F) Relative humidity: About 55% Lighting First 8 weeks: 7 h per day; Thereafter: 16-17 h per day. At least 6 foot candles at bird level.	
Egg Collection and Incubation			
Egg collection and storage collection interval:	Daily	Collected eggs were washed in a commercial egg washer with chlorine-based detergent at 46°C for 3 minutes; washed eggs were allowed to cool to room temperature and rinsed with fresh water prior to storage.	
storage temperature:	14.2 ± 1.0°C		
storage humidity:	84 ± 15%	EPA: eggs collected daily; storage temperature 16°C (61°F); humidity 65%.	
Were eggs candled for cracks prior to setting for incubation?	Yes	EPA requires eggs to be candled on day 0	
Were eggs set weekly?	Yes		
Incubation conditions temperature:	37.5 ± 0.0°C		
humidity:	Approx. 56%		
When candling was done for fertility?	Day 14 for embryo viability and Day 21 for embryo survival.	EPA: Quail approx. day 11; duck approx. day 14	
When eggs were transferred to hatcher	Day 24	EPA: Bobwhite day 21; mallard day 23	
Hatching conditions temperature:	37.2 ± 0.0°C	EPA requires: temperature of 39°C (102°F)	
humidity:	Approx. 76%	humidity of 70%	
photo-period:	16 hours light/day (hatchlings)		
When hatched eggs were removed, counted	Days 27 or 28	EPA : Bobwhite day 24 Mallard day 27	

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Parameter	Details	Remarks	
		Criteria	
Were egg shells washed and dried for at least 48 hrs before measuring?	Yes, shells were washed and air-dried for at least 1 week.		
Egg shell thickness no. of eggs used:	One egg was collected (when available) from each odd numbered cage during odd numbered weeks and from each even numbered cage during the even numbered weeks.	<i>EPA requires newly hatched eggs be collected at least once every two weeks. Thickness of the shell plus membrane should be measured to the nearest 0.01 mm; 3 - 4 measurements per shell.</i>	
intervals:	Once weekly throughout the egg laying period.		
mode of measurement:	Five points around the equatorial circumference were measured to the nearest 0.005 mm.		
Reference chemical, if used	None used		

2. Observations:

Table 3: Observations.

Table 04. Observations		
Parameter	Details	Remarks/Criteria
Parameters measured		
Parental:	Mortality, body weight, food consumption, signs of toxicity, necropsy	EPA requires: Eggs laid/pen, Eggs cracked/pen, Eggs set/pen, Viable embryos/pen, Live 3-week embryos/pen, Normal hatchlings/pen, 14-day-old survivors/pen, 14-day-old survivors/pen, Weights of 14-day-old survivors (mean per pen), Egg shell thickness, Food consumption (mean per pen), Initial and final body weight (mean per pen)
Egg collection development:	Eggs laid, eggs cracked, eggshell thickness, eggs set, viable embryos, live 3-week embryos, number of hatchlings, hatchling body weight, number of 14-day-old survivors, 14-day-old survivor body weight	
Indicate if the test material was regurgitated	No indications of dietary regurgitation.	

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Parameter	Details	Remarks/Criteria
Observation intervals (for various parameters)	Parental and hatchling mortality and signs of toxicity were recorded once daily. Parental body weights were recorded at the start of acclimation, at Weeks 0, 2, 4, 6, 8 and at test termination (Week 22). Parental food consumption was determined weekly.	<i>Body weights and food consumption must be measured at least biweekly.</i>
Were raw data included?	Yes, sufficient.	

I. RESULTS AND DISCUSSION:

A. MORTALITY:

No treatment-related mortality was observed during the study; however, two incidental mortalities occurred, one each from the control and 175 ppm groups.

The single mortality in the control group was a hen that was found dead during Week 5. The day prior to death, the hen exhibited reduced reaction to external stimuli, lower limb weakness, and shallow and rapid respiration. The bird was thin, with reduced muscle mass. No external lesions were observed. Internally, multiple plaques and lesions which appeared fungal in nature were noted on the lungs, air sacs, and throughout the abdominal cavity. The gizzard was empty and the gizzard lining appeared to be bile-stained. No other lesions were noted, and aside from lesions of bumblefoot, necropsy of the pen-mate was unremarkable.

The single mortality in the 175 ppm group was a drake that was found dead during Week 14. The bird was observed with a slight limp and lesions of bumblefoot during Week 6. The drake appeared normal by the end of Week 7. Lameness and bumblefoot again were noted during Week 11. These effects improved during subsequent weeks, but the animal was noted to be thin. Immediately prior to death, the drake was prostrate with legs extended, with a prominent keel. The bird was thin and appeared to have some loss of muscle mass, extensive lesions of bumblefoot on both feet, and a fecal and urinate-matted vent. Internally, the spleen was greatly enlarged and there was evidence of slight peritonitis and adhesions in the abdominal cavity. Approximately 25 cm of the middle of the small intestines was greatly distended and hemorrhagic, with caseous necrosis and hemorrhagic areas in the gut wall. The testes appeared to be regressing. No other lesions were noted, and necropsy of the pen-mate was unremarkable.

No other mortalities were observed during the study, and due to the nature of lesions observed at necropsy, the single mortality at the 175 ppm level was considered not to be related to treatment.

Table 4: Effect of Metaldehyde Technical on Mortality of *Anas platyrhynchos*.

Treatment, ppm a.i. measured (nominal)	Week 7		Week 14		Week 22	
	No. Dead Male	No. Dead Female	No. Dead Male	No. Dead Female	No. Dead Male	No. Dead Female
Control	0	1	0	1	0	1
49 (50)	0	0	0	0	0	0
176 (175)	0	0	1	0	1	0
497 (500)	0	0	0	0	0	0

B. REPRODUCTIVE AND OTHER ENDPOINTS:

Abnormal Effects/Behavior: Clinical signs that appeared to be treatment related were observed in three hens from the 500 ppm level. In all instances, during a washing procedure when the birds were allowed to bathe in a gentle spray of water, hens were observed to exhibit convulsive behavior at only one time interval. Episodes occurred in single birds during Weeks 12, 19, and 20. In all cases, the hens appeared to recover completely within 15 minutes of the episode and the clinical signs did not re-occur. No other treatment-related clinical signs of toxicity were observed. Incidental clinical observations normally associated with pen wear and/or interactions among pen mates were observed in all test groups and included eye lesions, feather loss, and foot and ankle lesions with resultant lameness. The LOAEC for clinical signs of toxicity in adult birds was 500 ppm.

Food Consumption: Due to excessive feed wastage by some birds, feed consumption was variable between pens. However, no treatment-related effects were observed. Statistically-significant differences from the control group were observed at the 50 ppm level during Week 2, at the 175 ppm level during Week 9, and at the 500 ppm level during Weeks 2, 3, and 17; however, these differences were small and lacked a consistent pattern of change. Overall feed consumption averaged 136 g/bird/day for the control group, compared to 145, 136, and 133 g/bird/day for the 50, 175, and 500 ppm groups, respectively (reviewer-calculated). The LOAEC for food consumption was >500 ppm.

Body Weight: No treatment-related effects on body weight were observed, with no statistically-significant differences between the control and any treatment group at any of the intervals. The LOAEC for adult body weight was >500 ppm.

Necropsy: The study authors noted that the incidence of regressed or regressing ovaries tended to increase with increasing concentration. The reviewer observed that the incidence was clearly increased with regressing ovaries, but the number of fully regressed ovaries was highest at the 50 ppm level, with no regressed ovaries at the 175 or 500 ppm levels. The numbers of regressing ovaries were 6/15, 7/16, 10/15, and 14/16 for the control, 50, 175, and 500 ppm levels, respectively, and the numbers of regressed ovaries were 1/15, 4/16, 0/15, and 0/16, respectively. When combined, the numbers of regressing/regressed ovaries were 7/15, 11/16, 10/15, and 14/16 for the control, 50, 175, and 500 ppm levels, respectively. There were no other findings at necropsy that were related to treatment with Metaldehyde Technical. The LOAEC for post-mortem findings was not reported.

Reproductive Effects: No treatment-related effects were observed on egg production or quality, fertility, embryonic development, hatchability, or survival of hatchlings at the 50 or 175 ppm test levels. At the 50 ppm level, there was a slight, statistically-significant reduction compared to the control group in hatchlings as a

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percentage of live 3-week embryos (86 versus 95% for the control group). However, the difference observed was the result of exceptional hatchability in the control group ($95 \pm 4\%$ compared to a historical control value of $70 \pm 10\%$). Furthermore, the hatchability at the 50 ppm level ($86 \pm 10\%$) was also above the historical control value, and no statistical difference was observed at the next higher treatment level of 175 ppm. Therefore, this difference was not considered to be related to treatment.

At the 500 ppm level, treatment-related effects on egg production, egg quality (thickness), hatching success, survival of hatchlings, and consequently overall hatching success (measured as the number of 14-day old survivors/hen, 17 versus 34 for the control) were observed. While the reduction in egg production (percentage of eggs laid of maximum laid) was not statistically-different from the control (40 versus 58%), it appeared to be the result of a decrease in the number of hens laying a high number (>50) of eggs, and the effect was most notable during the latter portion of the egg production period. Egg quality was also affected at this level, with a statistically-significant reduction compared to the control in mean egg shell thickness (0.350 versus 0.378 mm). The reductions in hatching success and hatchling survival were evident in statistically-significant reductions compared to the control in the percentage of hatchlings of 3-week embryos (80 versus 95%) and the percentage of 14-day old survivors of hatchlings (88 versus 99%). The effects were further reflected in statistically-significant reductions in the percentage of hatchlings of eggs set (64 versus 85%), the percentage of 14-day old survivors of eggs set (56 versus 84%), the percentage of hatchlings of maximum eggs set (27 versus 50%), and the percentage of 14-day old survivors of maximum eggs set (24 versus 49%).

No overt signs of toxicity were observed in hatchlings from the control, 50, or 175 ppm levels, and no treatment-related effect on offspring body weights were observed at any treatment level. Offspring from the 500 ppm level displayed profound clinical signs that appeared to be treatment related. In general, up to approximately one-third of the offspring hatched in any given week displayed dorsal or ventral neck curl, and circling behavior. Furthermore, the ducklings from this level appeared more excitable and disoriented than normal offspring. In a number of cases, the ducklings that survived appeared to improve as they matured. The LOAEC for effects on reproduction was 500 ppm.

Table 5: Reproductive and other parameters (nominal concentrations; study author-reported).

Parameter	Control	50 ppm	175 ppm	500 ppm	NOAEC	LOAEC
Eggs laid	682	750	682	511	N/A	N/A
Eggs laid/hen	45	47	45	32	N/A	N/A
Eggs laid/hen/day	0.52	0.54	0.52	0.37	N/A	N/A
Eggs laid/maximum laid (%)	58	59	58	40*	175 ppm	500 ppm
Eggs cracked	20	15	8	22	N/A	N/A
Eggs cracked/eggs laid (%)	3	2	1	4	500 ppm	>500 ppm
Shell thickness (mm \pm SD)	0.378 \pm 0.027	0.381 \pm 0.033	0.375 \pm 0.026	0.350 \pm 0.030*	175 ppm	500 ppm
Eggs set	590	659	599	434	N/A	N/A
Viable embryos	552	533	480	371	N/A	N/A
Viable embryos/eggs set (%)	90	78	80	81	500 ppm	>500 ppm
Live 3-week embryos	550	525	475	366	N/A	N/A
Live 3-week embryos/viable embryos (%)	100	98	99	99	500 ppm	>500 ppm
No. of hatchlings	519	457	422	296	N/A	N/A

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Parameter	Control	50 ppm	175 ppm	500 ppm	NOAEC	LOAEC
No. of hatchlings/live 3-week embryos (%)	95	86*	89	80**	175 ppm	500 ppm
No. of hatchlings/eggs set (%)	85	66	71	64*	175 ppm	500 ppm
Hatchling weight (g \pm SD)	33 \pm 3	34 \pm 3	34 \pm 3	33 \pm 3	500 ppm	>500 ppm
No. of 14-day old survivors	511	454	414	265	N/A	N/A
No. of 14-day old survivors/hen	34	28	28	17	N/A	N/A
No. of 14-day old survivors/No. of hatchlings (%)	99	99	98	88**	175 ppm	500 ppm
No. of 14-day old survivors/eggs set (%)	84	66	70	56**	175 ppm	500 ppm
14-day old survivors weight (g \pm SD)	298 \pm 35	297 \pm 32	284 \pm 41	274 \pm 37	500 ppm	>500 ppm
Mean adult food consumption (g/pen/day) ¹	136	145	136	133	500 ppm	>500 ppm
Weight of adult males, g at start of treatment: at Week 8: at Week 22 (study termination):	1216 1188 1201	1232 1161 1196	1219 1162 1222	1235 1184 1219	500 ppm	>500 ppm
Weight of adult females, g at start of treatment: at Week 8: at Week 22 (study termination):	1087 1077 1128	1075 1031 1090	1064 1050 1127	1067 1091 1104	500 ppm	>500 ppm
Gross pathology						
Ovary Regressing	6/15	7/16	10/15	14/16		Not
Ovary Regressed	1/15	4/16	0/15	0/16		reported

N/A = Not statistically-analyzed.

* Significantly different from the control at $p < 0.05$.

** Significantly different from the control at $p < 0.01$.

¹ Reviewer-calculated from mean weekly data.

C. REPORTED STATISTICS:

The following variables were statistically analyzed: adult body weight, adult feed consumption, eggs laid of maximum laid, eggs cracked of eggs laid, viable embryos of eggs set, live 3-week embryos of viable embryos, hatchlings of 3-week embryos, 14-day old survivors of hatchlings, hatchlings of eggs set, 14-day old survivors of eggs set, hatchlings of maximum set, 14-day old survivors of maximum set, egg shell thickness, and offspring's body weight.

An analysis of variance (ANOVA) was performed to determine statistically-significant differences between groups. Dunnett's multiple comparison procedure was then used to compare the treatment means with the control group mean. Sample units were the individual pens within each experimental group, except adult body weights, where the sample unit was the individual bird. Percentage data were examined using Dunnett's method following arcsine square root transformation. Nominal concentrations were used for all estimations.

D. VERIFICATION OF STATISTICAL RESULTS:

Statistical Method: Analysis was conducted using "chicks.sas" (Ver. 3; March 2002), a SAS program provided by EFED/OPP/USEPA. Data for all endpoints were examined graphically using box plots to determine if they exhibited a dose-dependent response, which was ultimately used to select the multiple comparison test to detect LOAEC and NOAEC. Data for each endpoint were tested to determine if their distributions were normal and if their variances were homogeneous using Shapiro-Wilk's and Levene's tests, respectively. Data that satisfied these assumptions were subjected to Dunnett's and William's tests and data that did not satisfy these assumptions were subjected to the non-parametric Mann-Whitney-U (with a Bonferroni adjustment) and Jonckheere's tests. Data for dead birds were excluded from the analyses. See Appendix I for output of reviewer's statistical verification and graphs for affected endpoints to support any reviewer-generated conclusions that may differ from those reported in the study.

Table 6. Reproductive and other parameters (mean-measured concentrations; reviewer-reported).

Parameter	Control	49 ppm	176 ppm	497 ppm	NOAEC	LOAEC
Eggs laid/pen	45	47	45	32	497 ppm	>497 ppm
Eggs cracked/pen	1.3	0.9	0.5	1.4	497 ppm	>497 ppm
Eggs not cracked/eggs laid (%)	96.8	98.1	98.7	95.5	497 ppm	>497 ppm
Eggs set/pen	39.3	41.2	39.9	27.1*	176 ppm	497 ppm
Shell thickness	0.35	0.38	0.37	0.35	497 ppm	>497 ppm
Eggs set/eggs laid (%)	85.7	87.9	87.6	82.4	497 ppm	>497 ppm
Viable embryo/pen	36.8	33.3	32.0	23.2	497 ppm	>497 ppm
Viable embryos/eggs set (%)	90.5	77.6	80.2	80.6	497 ppm	>497 ppm
Live embryos/pen	36.7	32.8	31.7	22.9	497 ppm	>497 ppm
Live embryo/viable embryo (%)	99.7	98.3	99.1	98.9	497 ppm	>497 ppm
No. of hatchlings/pen	34.6	28.6	28.1	18.5*	176 ppm	497 ppm
No. of hatchlings/eggs laid (%)	73.9	57.9*	62.6*	54.4*	<49 ppm	49 ppm
No. of hatchlings/eggs set (%)	85.4	65.9*	71.1*	63.5*	<49 ppm	49 ppm
No. of hatchlings/live embryos (%)	94.9	86.1*	89.3*	80.2*	<49 ppm	49 ppm
Hatchling survival/pen	34.1	28.4	27.6	16.6*	176 ppm	497 ppm
Hatchling survival/eggs set (%)	84.3	65.5*	69.7	55.8*	<49 ppm	49 ppm
Hatchling survival/no. of hatchlings (%)	98.8	99.5	98.1	88.0*	176 ppm	497 ppm
Hatchling weight (g)	30.4	29.2	31.4	28.8	497 ppm	>497 ppm
Survivor weight (g)	277.1	256.3	259.1	234.2	497 ppm	>497 ppm
Mean food consumption (g/bird/day)	135.7	145.1	136.4	133.6	497 ppm	>497 ppm
Male weight gain (g)	-6.5	-36.5	7.6	-16.6	497 ppm	>497 ppm
Female weight gain (g)	104.7	14.5	59.4	36.8	497 ppm	>497 ppm

* Significantly different from the control at $p < 0.05$.

E. STUDY DEFICIENCIES: There were no significant deviations from U.S. EPA guideline §71-4(b) that affected the validity or acceptability of this study.

F. REVIEWER'S COMMENTS:

Results of the reviewer's statistical analysis differed slightly from those of the study authors. The reviewer's analysis detected greater sensitivity of some reproductive endpoints (*i.e.*, number hatched to eggs set, number hatched to live embryos, hatchling survival to eggs set); the study authors concluded that differences were significant only at the highest treatment level, while the reviewer's analysis detected significant reductions at all treatment levels (ratios of number hatched to eggs set and number hatched to live embryos) or at the lowest treatment level (hatchling survival to eggs set). In addition, the reviewer's analysis detected significant effects on several endpoints that were not statistically analyzed by the study authors, including eggs set, number hatched, ratio of number hatched to eggs laid, and hatchling survival. The reviewer's results are based on the mean measured concentrations and are reported in the Conclusions and Executive Summary sections.

G. CONCLUSIONS:

This study is scientifically sound, but it does not fulfill the guideline requirements for a reproductive toxicity study with Mallard duck (§71-4b) because a NOAEC could not be identified. As a result, this study is classified as Supplemental.

NOAEC: <49 ppm a.i.

LOAEC: 49 ppm a.i.

Endpoint(s) Affected: Clinical signs of toxicity (adults and offspring), eggs set, number hatched, ratio of number hatched to eggs laid, number hatched to eggs set, number hatched to live embryos, hatchling survival, ratio of hatchling survival to eggs set, and hatchling survival to number hatched.

III. REFERENCES:

- American Society for Testing and Materials. 1986. Standard Practice for Conducting Reproductive Studies with Avian Species. E1062-86. Philadelphia, PA. 15 pp.
- U.S. Environmental Protection Agency. 1982. Pesticide Assessment Guidelines, FIFRA Subdivision E, Hazard Evaluation: Wildlife and Aquatic Organisms, Subsection 71-4. Environmental Protection Agency, Office of Pesticide Programs, October, 1982.
- National Institute of Health. 1985. Guide for the Care and Use of Laboratory Animals. Pub. No. 85-23. 83 pp.
- Dunnett, C.W. 1955. A Multiple Comparisons Procedure for Comparing Several Treatments with a Control. Jour. Amer. Statis. Assoc. 50: 1096-1121.
- Dunnett, C.W. 1964. New Tables for Multiple Comparisons with a Control. Biometrics 20: 482-491.

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 PMRA Submission Number

EPA MRID Number 42867902

APPENDIX I. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION:

Mallard repro, Metaldehyde, MRID 42867902

PRINTOUT OF RAW DATA

Obs	TRT	EL	EC	ENC	EL	ES	ES	EL	VE	VE	ES	LE	LE	VE	NH	NH	EL	NH	ES
1	Ctrl	31	1	96.77	26	83.87	26	100.00	26	100.00	26	100.00	26	100.00	26	83.87	100.00		
2	Ctrl	45	2	95.56	37	82.22	35	94.59	35	100.00	35	100.00	35	100.00	35	77.78	94.59		
3	Ctrl	22	0	100.00	20	90.91	18	90.00	18	100.00	16	100.00	16	100.00	16	72.73	80.00		
4	Ctrl	58	0	100.00	51	87.93	47	92.16	45	95.74	43	74.14	43	74.14	43	74.14	84.31		
5	Ctrl	68	3	95.59	59	86.76	58	98.31	58	100.00	51	75.00	51	75.00	51	75.00	86.44		
6	Ctrl	69	0	100.00	62	89.86	55	88.71	55	100.00	54	78.26	54	78.26	54	78.26	87.10		
7	Ctrl	66	2	96.97	56	84.85	52	92.86	52	100.00	49	74.24	49	74.24	49	74.24	87.50		
8	Ctrl	20	3	85.00	13	65.00	5	38.46	5	100.00	5	25.00	5	25.00	5	25.00	38.46		
9	Ctrl	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
10	Ctrl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
11	Ctrl	60	1	98.33	52	86.67	50	96.15	50	100.00	47	78.33	47	78.33	47	78.33	90.38		
12	Ctrl	79	3	96.20	69	87.34	67	97.10	67	100.00	63	79.75	63	79.75	63	79.75	91.30		
13	Ctrl	56	3	94.64	48	85.71	47	97.92	47	100.00	41	73.21	41	73.21	41	73.21	85.42		
14	Ctrl	50	1	98.00	45	90.00	44	97.78	44	100.00	43	86.00	43	86.00	43	86.00	95.56		
15	Ctrl	19	0	100.00	17	89.47	15	88.24	15	100.00	14	73.68	14	73.68	14	73.68	82.35		
16	Ctrl	39	1	97.44	35	89.74	33	94.29	33	100.00	32	82.05	32	82.05	32	82.05	91.43		
17	Dose1	54	1	98.15	47	87.04	45	95.74	44	97.78	42	77.78	42	77.78	42	77.78	89.36		
18	Dose1	38	0	100.00	34	89.47	33	97.06	32	96.97	25	65.79	25	65.79	25	65.79	73.53		
19	Dose1	47	1	97.87	39	82.98	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00		
20	Dose1	42	1	97.62	37	88.10	26	70.27	26	100.00	24	57.14	24	57.14	24	57.14	64.86		
21	Dose1	24	0	100.00	21	87.50	17	80.95	17	100.00	10	41.67	10	41.67	10	41.67	47.62		
22	Dose1	25	0	100.00	23	92.00	10	43.48	9	90.00	8	32.00	8	32.00	8	32.00	34.78		
23	Dose1	64	2	96.88	53	82.81	51	96.23	51	100.00	48	75.00	48	75.00	48	75.00	90.57		
24	Dose1	50	0	100.00	45	90.00	45	100.00	45	100.00	35	70.00	35	70.00	35	70.00	77.78		
25	Dose1	37	1	97.30	33	89.19	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00		
26	Dose1	57	0	100.00	51	89.47	41	80.39	41	100.00	38	66.67	38	66.67	38	66.67	74.51		
27	Dose1	41	1	97.56	37	90.24	35	94.59	35	100.00	33	80.49	33	80.49	33	80.49	89.19		
28	Dose1	30	0	100.00	27	90.00	27	100.00	27	100.00	22	73.33	22	73.33	22	73.33	81.48		
29	Dose1	72	1	98.61	65	90.28	64	98.46	63	98.44	58	80.56	58	80.56	58	80.56	89.23		
30	Dose1	28	2	92.86	23	82.14	22	95.65	22	100.00	21	75.00	21	75.00	21	75.00	91.30		
31	Dose1	73	1	98.63	66	90.41	64	96.97	61	95.31	51	69.86	51	69.86	51	69.86	77.27		
32	Dose1	68	4	94.12	58	85.29	53	91.38	52	98.11	42	61.76	42	61.76	42	61.76	72.41		
33	Dose2	56	1	98.21	48	85.71	46	95.83	45	97.83	45	80.36	45	80.36	45	80.36	93.75		
34	Dose2	34	0	100.00	27	79.41	21	77.78	21	100.00	17	50.00	17	50.00	17	50.00	62.96		
35	Dose2	55	0	100.00	45	81.82	29	64.44	29	100.00	24	43.64	24	43.64	24	43.64	53.33		
36	Dose2	54	0	100.00	50	92.59	50	100.00	50	100.00	46	85.19	46	85.19	46	85.19	92.00		
37	Dose2	63	1	98.41	56	88.89	53	94.64	52	98.11	40	63.49	40	63.49	40	63.49	71.43		
38	Dose2	27	0	100.00	24	88.89	23	95.83	23	100.00	23	85.19	23	85.19	23	85.19	95.83		
39	Dose2	46	1	97.83	39	84.78	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00		
40	Dose2	46	0	100.00	42	91.30	30	71.43	30	100.00	26	56.52	26	56.52	26	56.52	61.90		
41	Dose2	38	0	100.00	34	89.47	33	97.06	33	100.00	32	84.21	32	84.21	32	84.21	94.12		
42	Dose2	38	0	100.00	33	86.84	33	100.00	32	96.97	27	71.05	27	71.05	27	71.05	81.82		
43	Dose2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
44	Dose2	32	1	96.88	29	90.63	29	100.00	29	100.00	26	81.25	26	81.25	26	81.25	89.66		
45	Dose2	33	1	96.97	28	84.85	24	85.71	23	95.83	20	60.61	20	60.61	20	60.61	71.43		
46	Dose2	31	2	93.55	27	87.10	17	62.96	17	100.00	17	54.84	17	54.84	17	54.84	62.96		
47	Dose2	64	0	100.00	59	92.19	38	64.41	38	100.00	32	50.00	32	50.00	32	50.00	54.24		
48	Dose2	65	1	98.46	58	89.23	54	93.10	53	98.15	47	72.31	47	72.31	47	72.31	81.03		
49	Dose3	27	0	100.00	24	88.89	22	91.67	22	100.00	15	55.56	15	55.56	15	55.56	62.50		
50	Dose3	29	2	93.10	24	82.76	24	100.00	24	100.00	21	72.41	21	72.41	21	72.41	87.50		
51	Dose3	63	1	98.41	55	87.30	50	90.91	49	98.00	35	55.56	35	55.56	35	55.56	63.64		
52	Dose3	32	3	90.63	26	81.25	25	96.15	24	96.00	22	68.75	22	68.75	22	68.75	84.62		
53	Dose3	73	7	90.41	60	82.19	53	88.33	51	96.23	44	60.27	44	60.27	44	60.27	73.33		
54	Dose3	22	0	100.00	19	86.36	19	100.00	19	100.00	7	31.82	7	31.82	7	31.82	36.84		
55	Dose3	48	2	95.83	40	83.33	26	65.00	26	100.00	24	50.00	24	50.00	24	50.00	60.00		
56	Dose3	20	1	95.00	17	85.00	16	94.12	15	93.75	12	60.00	12	60.00	12	60.00	70.59		
57	Dose3	6	1	83.33	2	33.33	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00		

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58	Dose3	30	0	100.00	28	93.33	27	96.43	27	100.00	23	76.67	82.14
59	Dose3	17	1	94.12	13	76.47	11	84.62	11	100.00	9	52.94	69.23
60	Dose3	26	1	96.15	23	88.46	0	0.00	0	100.00	0	0.00	0.00
61	Dose3	33	2	93.94	28	84.85	25	89.29	25	100.00	21	63.64	75.00
62	Dose3	21	0	100.00	18	85.71	18	100.00	18	100.00	14	66.67	77.78
63	Dose3	35	1	97.14	30	85.71	29	96.67	29	100.00	23	65.71	76.67
64	Dose3	29	0	100.00	27	93.10	26	96.30	26	100.00	26	89.66	96.30

Mallard repro, Metaldehyde, MRID 42867902

PRINTOUT OF RAW DATA (continued)

Obs	TRT	NH	LE	HS	HS	ES	HS	NH	THICK	HATWT	SURVWT	FOOD	WTGAINM	WTGAINF
1	Ctrl	100.00	26	100.00	100.00	0.36	35	270	111	-45	87			
2	Ctrl	100.00	34	91.89	97.14	0.39	31	287	112	-68	98			
3	Ctrl	88.89	16	80.00	100.00	0.36	34	316	112	114	71			
4	Ctrl	95.56	42	82.35	97.67	0.41	34	276	123	62	99			
5	Ctrl	87.93	49	83.05	96.08	0.40	30	275	158	24	166			
6	Ctrl	98.18	50	80.65	92.59	0.38	33	300	133	35	-39			
7	Ctrl	94.23	49	87.50	100.00	0.38	36	346	178	-106	1007			
8	Ctrl	100.00	5	38.46	100.00	0.35	34	276	100	-152	95			
9	Ctrl	.	0	.	.	0.00	0	0	141	31	-93			
10	Ctrl	.	.	.	.	.	.	.	.	.	.
11	Ctrl	94.00	47	90.38	100.00	0.35	32	305	126	10	55			
12	Ctrl	94.03	63	91.30	100.00	0.37	32	304	199	-87	13			
13	Ctrl	87.23	41	85.42	100.00	0.37	33	307	110	46	-69			
14	Ctrl	97.73	43	95.56	100.00	0.37	30	266	149	-24	-16			
15	Ctrl	93.33	14	82.35	100.00	0.45	30	312	149	-9	-26			
16	Ctrl	96.97	32	91.43	100.00	0.38	32	316	135	72	123			
17	Dose1	95.45	42	89.36	100.00	0.35	32	267	164	-108	44			
18	Dose1	78.13	25	73.53	100.00	0.37	38	319	138	57	97			
19	Dose1	.	0	0.00	.	0.38	0	0	125	-35	84			
20	Dose1	92.31	24	64.86	100.00	0.35	32	300	131	-218	23			
21	Dose1	58.82	10	47.62	100.00	0.34	31	236	156	16	7			
22	Dose1	88.89	8	34.78	100.00	0.35	31	285	140	43	-182			
23	Dose1	94.12	48	90.57	100.00	0.38	34	312	129	-107	17			
24	Dose1	77.78	34	75.56	97.14	0.43	38	317	143	-99	-28			
25	Dose1	.	0	0.00	.	0.38	0	0	139	-149	-8			
26	Dose1	92.68	37	72.55	97.37	0.37	33	293	137	69	-5			
27	Dose1	94.29	33	89.19	100.00	0.38	33	280	158	195	-10			
28	Dose1	81.48	22	81.48	100.00	0.37	33	280	127	-199	-40			
29	Dose1	92.06	58	89.23	100.00	0.39	33	306	111	-1	62			
30	Dose1	95.45	21	91.30	100.00	0.43	33	294	142	-108	-105			
31	Dose1	83.61	50	75.76	98.04	0.36	30	280	195	7	52			
32	Dose1	80.77	42	72.41	100.00	0.45	36	332	186	53	224			
33	Dose2	100.00	45	93.75	100.00	0.40	36	278	128	71	78			
34	Dose2	80.95	17	62.96	100.00	0.37	32	280	115	68	196			
35	Dose2	82.76	24	53.33	100.00	0.38	34	281	126	72	185			
36	Dose2	92.00	46	92.00	100.00	0.39	37	302	123	-18	56			
37	Dose2	76.92	40	71.43	100.00	0.39	34	290	142	88	40			
38	Dose2	100.00	22	91.67	95.65	0.37	32	205	130	85	-44			
39	Dose2	.	0	0.00	.	0.38	0	0	154	-9	9			
40	Dose2	86.67	24	57.14	92.31	0.38	32	255	117	74	-84			
41	Dose2	96.97	32	94.12	100.00	0.34	33	329	123	-85	-4			
42	Dose2	84.38	26	78.79	96.30	0.40	33	307	147	12	42			
43	Dose2	.	.	.	.	.	.	.	.	.	.
44	Dose2	89.66	25	86.21	96.15	0.34	35	291	133	-3	-19			
45	Dose2	86.96	20	71.43	100.00	0.33	34	259	150	12	120			
46	Dose2	100.00	17	62.96	100.00	0.37	35	303	136	-21	198			
47	Dose2	84.21	31	52.54	96.88	0.37	29	223	142	-191	97			
48	Dose2	88.68	45	77.59	95.74	0.37	35	284	180	-41	21			
49	Dose3	68.18	15	62.50	100.00	0.39	31	287	118	106	-147			
50	Dose3	87.50	20	83.33	95.24	0.37	35	264	122	112	25			
51	Dose3	71.43	31	56.36	88.57	0.33	35	276	171	18	301			
52	Dose3	91.67	20	76.92	90.91	0.36	28	276	130	-88	-155			

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53	Dose3	86.27	44	73.33	100.00	0.36	35	302	130	-39	216
54	Dose3	36.84	7	36.84	100.00	0.39	34	302	116	116	-18
55	Dose3	92.31	22	55.00	91.67	0.34	32	270	125	2	127
56	Dose3	80.00	12	70.59	100.00	0.32	31	244	102	-249	-121
57	Dose3	.	0	0.00	.	0.31	0	0	122	-175	4
58	Dose3	85.19	22	78.57	95.65	0.37	33	274	145	-87	-15
59	Dose3	81.82	4	30.77	44.44	0.26	33	203	120	4	93
60	Dose3	.	0	0.00	.	0.37	0	0	159	40	13
61	Dose3	84.00	14	50.00	66.67	0.36	34	222	169	78	-36
62	Dose3	77.78	13	72.22	92.86	0.35	31	293	130	52	19
63	Dose3	79.31	17	56.67	73.91	0.36	37	279	127	-24	131
64	Dose3	100.00	24	88.89	92.31	0.35	32	255	152	-131	151

Mallard repro, Metaldehyde, MRID 42867902
ANALYSIS RESULTS FOR VARIABLE EL (Eggs Laid)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.989	0.852	1.962	0.130	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	45.47	22.88	5.91	50.31	32.80, 58.13
Dose1	16	46.88	16.52	4.13	35.24	38.07, 55.68
Dose2	15	45.47	13.20	3.41	29.02	38.16, 52.77
Dose3	16	31.94	16.85	4.21	52.75	22.96, 40.91

Level	Median	Min	Max	% of Control (means)	% Reduction (means)
Ctrl	50.00	0.00	79.00	.	.
Dose1	44.50	24.00	73.00	103.10	-3.10
Dose2	46.00	27.00	65.00	100.00	0.00
Dose3	29.00	6.00	73.00	70.24	29.76

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	58	2.51	0.067

Dunnett - testing each trt mean signif. less than control

Williams - test assumes dose-response relationship, testing negative trend

Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	45.47	.	46.19	.	0.996	1.000	0.156	.	.
Dose1	46.88	0.821	46.19	0.632	.	0.996	0.090	.	.
Dose2	45.47	0.747	45.47	0.618	.	.	0.156	.	.
Dose3	31.94	0.047	31.94	0.023	.	.	.	.	.

SUMMARY

	NOAEC	LOAEC
Dunnett	Dose2	Dose3
Williams	Dose2	Dose3

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE NEG_EC (Eggs Cracked)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.842	<.001	1.759	0.165	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	1.33	1.23	0.32	92.58	0.65, 2.02
Dose1	16	0.94	1.06	0.27	113.35	0.37, 1.50
Dose2	15	0.53	0.64	0.17	119.99	0.18, 0.89
Dose3	16	1.38	1.75	0.44	127.01	0.44, 2.31

Level	Median	Min	Max	%of Control (means)	%Reduction (means)
Ctrl	1.00	0.00	3.00	.	.
Dose1	1.00	0.00	4.00	70.31	29.69
Dose2	0.00	0.00	2.00	40.00	60.00
Dose3	1.00	0.00	7.00	103.13	-3.13

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	4.19	0.241

MannWhit(Bon) - testing each trt median signif. greater than control

Jonckheere - test assumes dose-response relationship, testing positive trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	1.00	.	.
Dose1	1.00	1.000	0.808
Dose2	0.00	1.000	0.969
Dose3	1.00	1.000	0.692

SUMMARY

MannWhit (Bonf adjust)
Jonckheere

NOAEC
Dose3
Dose3

LOAEC
>highest dose
>highest dose

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE ENC_EL ((EL-EC)/EL (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.856	<.001	2.916	0.042	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	14	96.75	3.85	1.03	3.98	94.53, 98.97
Dose1	16	98.10	2.13	0.53	2.17	96.96, 99.24
Dose2	15	98.69	1.84	0.48	1.87	97.67, 99.71
Dose3	16	95.50	4.63	1.16	4.84	93.04, 97.97

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	97.20	85.00	100.00	.	.
Dose1	98.38	92.86	100.00	101.39	-1.39
Dose2	100.00	93.55	100.00	102.00	-2.00
Dose3	95.99	83.33	100.00	98.71	1.29

NON-PARAMETRIC ANALYSES

- use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	6.71	0.082

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	97.20	.	.
Dose1	98.38	1.000	0.882
Dose2	100.00	1.000	0.974
Dose3	95.99	0.627	0.375

SUMMARY

MannWhit (Bonf adjust)
Jonckheere

NOAEC

Dose3
Dose3

LOAEC

>highest dose
>highest dose

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902
ANALYSIS RESULTS FOR VARIABLE ES (Eggs Set)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.991	0.926	2.136	0.105	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	39.33	20.31	5.25	51.65	28.08, 50.58
Dose1	16	41.19	14.56	3.64	35.34	33.43, 48.94
Dose2	15	39.93	12.19	3.15	30.52	33.19, 46.68
Dose3	16	27.13	14.50	3.63	53.46	19.40, 34.85

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	45.00	0.00	69.00	.	.
Dose1	38.00	21.00	66.00	104.71	-4.71
Dose2	39.00	24.00	59.00	101.53	-1.53
Dose3	25.00	2.00	60.00	68.96	31.04

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	58	2.79	0.048

Dunnett - testing each trt mean signif. less than control

Williams - test assumes dose-response relationship, testing negative trend

Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Dose1	Dose2	Tukey p-values Dose3	Dose4	Dose5
Ctrl	39.33	.	40.29	.	0.987	1.000	0.143	.	.
Dose1	41.19	0.851	40.29	0.654	.	0.996	0.064	.	.
Dose2	39.93	0.784	39.93	0.663	.	.	0.115	.	.
Dose3	27.13	0.043	27.13	0.020	.	.	.	.	.

SUMMARY

Dunnett

Williams

NOAEC

Dose2

Dose2

LOAEC

Dose3

Dose3

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE ES_EL (EggsSet/EggsLaid (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.596	<.001	1.517	0.220	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	14	85.74	6.49	1.73	7.57	81.99, 89.49
Dose1	16	87.93	3.06	0.77	3.48	86.30, 89.56
Dose2	15	87.58	3.77	0.97	4.30	85.49, 89.67
Dose3	16	82.38	13.74	3.44	16.68	75.06, 89.70

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	87.05	65.00	90.91	.	.
Dose1	89.33	82.14	92.00	102.56	-2.56
Dose2	88.89	79.41	92.59	102.15	-2.15
Dose3	85.36	33.33	93.33	96.08	3.92

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	5.08	0.166

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	87.05	.	.
Dose1	89.33	1.000	0.869
Dose2	88.89	1.000	0.751
Dose3	85.36	0.333	0.119

SUMMARY

	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE VE (Viable Embryo(d14))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.977	0.293	2.030	0.120	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	36.80	20.15	5.20	54.77	25.64, 47.96
Dose1	16	33.31	20.28	5.07	60.88	22.51, 44.12
Dose2	15	32.00	14.69	3.79	45.90	23.87, 40.13
Dose3	16	23.19	14.14	3.54	60.99	15.65, 30.72

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	44.00	0.00	67.00	.	
Dose1	34.00	0.00	64.00	90.52	9.48
Dose2	30.00	0.00	54.00	86.96	13.04
Dose3	24.50	0.00	53.00	63.01	36.99

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	58	1.71	0.176

Dunnett - testing each trt mean signif. less than control

Williams - test assumes dose-response relationship, testing negative trend

Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	36.80	.	36.80	.	0.945	0.877	0.148	.	.
Dose1	33.31	0.516	33.31	0.348	.	0.997	0.369	.	.
Dose2	32.00	0.429	32.00	0.292	.	.	0.507	.	.
Dose3	23.19	0.044	23.19	0.021	.	.	.	.	.

SUMMARY

Dunnett

Williams

NOAEC

Dose2

Dose2

LOAEC

Dose3

Dose3

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE VE_ES (ViableEmbryo/EggsSet (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.688	<.001	2.002	0.124	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	14	90.47	15.42	4.12	17.04	81.57, 99.37
Dose1	16	77.57	33.62	8.40	43.34	59.66, 95.49
Dose2	15	80.21	26.27	6.78	32.75	65.66, 94.76
Dose3	16	80.59	32.58	8.15	40.43	63.23, 97.95

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	94.44	38.46	100.00	.	.
Dose1	95.12	0.00	100.00	85.75	14.25
Dose2	93.10	0.00	100.00	88.67	11.33
Dose3	92.89	0.00	100.00	89.08	10.92

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	0.81	0.847

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	94.44	.	.
Dose1	95.12	1.000	0.287
Dose2	93.10	0.620	0.223
Dose3	92.89	0.826	0.316

SUMMARY

MannWhit (Bonf adjust)
Jonckheere

NOAEC
Dose3
Dose3

LOAEC
>highest dose
>highest dose

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902
ANALYSIS RESULTS FOR VARIABLE LE (Live Embryo(d21))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.977	0.286	2.104	0.110	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	36.67	20.09	5.19	54.79	25.54, 47.79
Dose1	16	32.81	19.86	4.97	60.54	22.23, 43.40
Dose2	15	31.67	14.45	3.73	45.63	23.66, 39.67
Dose3	16	22.88	13.77	3.44	60.19	15.54, 30.21

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	44.00	0.00	67.00	.	.
Dose1	33.50	0.00	63.00	89.49	10.51
Dose2	30.00	0.00	53.00	86.36	13.64
Dose3	24.00	0.00	51.00	62.39	37.61

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	58	1.78	0.161

Dunnett - testing each trt mean signif. less than control

Williams - test assumes dose-response relationship, testing negative trend

Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Dose1	Dose2	Tukey p-values Dose3	Dose4	Dose5
Ctrl	36.67	.	36.67	.	0.925	0.858	0.130	.	.
Dose1	32.81	0.486	32.81	0.321	.	0.998	0.372	.	.
Dose2	31.67	0.410	31.67	0.276	.	.	0.495	.	.
Dose3	22.88	0.039	22.88	0.018	.	.	.	.	.

SUMMARY

	NOAEC	LOAEC
Dunnett	Dose2	Dose3
Williams	Dose2	Dose3

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE LE_VE (LiveEmbryo/ViableEmbryo (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.750	<.001	2.934	0.042	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	14	99.70	1.14	0.30	1.14	99.04, 100.00
Dose1	14	98.33	2.82	0.75	2.86	96.70, 99.95
Dose2	14	99.06	1.41	0.38	1.43	98.25, 99.88
Dose3	14	98.86	2.06	0.55	2.08	97.67, 100.00

Level	Median	Min	Max	%of Control (means)	%Reduction (means)
Ctrl	100.00	95.74	100.00	.	.
Dose1	100.00	90.00	100.00	98.63	1.37
Dose2	100.00	95.83	100.00	99.37	0.63
Dose3	100.00	93.75	100.00	99.16	0.84

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	4.10	0.251

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	100.00		
Dose1	100.00	1.000	0.020
Dose2	100.00	1.000	0.076
Dose3	100.00	1.000	0.150

SUMMARY

MannWhit (Bonf adjust)
Jonckheere

NOAEC

Dose3
Dose3

LOAEC

>highest dose
>highest dose

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE NH (Number Hatched)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.981	0.452	2.240	0.093	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	34.60	18.75	4.84	54.18	24.22, 44.98
Dose1	16	28.56	17.87	4.47	62.58	19.04, 38.09
Dose2	15	28.13	12.79	3.30	45.46	21.05, 35.22
Dose3	16	18.50	11.71	2.93	63.28	12.26, 24.74

Level	Median	Min	Max	%of Control (means)	%Reduction (means)
Ctrl	41.00	0.00	63.00	.	.
Dose1	29.00	0.00	58.00	82.55	17.45
Dose2	26.00	0.00	47.00	81.31	18.69
Dose3	21.00	0.00	44.00	53.47	46.53

PARAMETRIC ANALYSES

- use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	58	2.85	0.045

Dunnett - testing each trt mean signif. less than control

Williams - test assumes dose-response relationship, testing negative trend

Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Dose1	Dose2	Tukey p-values Dose3	Dose4	Dose5
Ctrl	34.60	.	34.60	.	0.704	0.668	0.028	.	.
Dose1	28.56	0.292	28.56	0.170	.	1.000	0.271	.	.
Dose2	28.13	0.270	28.13	0.165	.	.	0.322	.	.
Dose3	18.50	0.008	18.50	0.003	.	.	.	.	.

SUMMARY

Dunnett

Williams

NOAEC

Dose2

Dose2

LOAEC

Dose3

Dose3

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE NH_EL (NumberHatched/EggsLaid (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.830	<.001	1.833	0.151	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	14	73.86	14.66	3.92	19.85	65.39, 82.33
Dose1	16	57.94	26.24	6.56	45.28	43.96, 71.92
Dose2	15	62.58	22.38	5.78	35.77	50.18, 74.97
Dose3	16	54.35	24.70	6.18	45.44	41.19, 67.51

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	76.39	25.00	86.00	.	.
Dose1	68.26	0.00	80.56	78.45	21.55
Dose2	63.49	0.00	85.19	84.72	15.28
Dose3	60.14	0.00	89.66	73.59	26.41

NON-PARAMETRIC ANALYSES

- use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	10.51	0.015

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	76.39	.	.
Dose1	68.26	0.034	0.007
Dose2	63.49	0.215	0.041
Dose3	60.14	0.004	0.003

SUMMARY

MannWhit (Bonf adjust)
Jonckheere

NOAEC

<lowest dose
<lowest dose

LOAEC

Dose1
Dose1

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE NH_ES (NumberHatched/EggsSet (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.817	<.001	2.019	0.121	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	14	85.35	14.54	3.89	17.04	76.95, 93.74
Dose1	16	65.87	30.08	7.52	45.66	49.84, 81.90
Dose2	15	71.10	24.67	6.37	34.70	57.44, 84.76
Dose3	16	63.51	28.19	7.05	44.39	48.49, 78.53

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	87.30	38.46	100.00	.	.
Dose1	75.89	0.00	91.30	77.18	22.82
Dose2	71.43	0.00	95.83	83.30	16.70
Dose3	71.96	0.00	96.30	74.41	25.59

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	10.18	0.017

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	87.30	.	.
Dose1	75.89	0.028	0.006
Dose2	71.43	0.144	0.030
Dose3	71.96	0.006	0.004

SUMMARY

	NOAEC	LOAEC
MannWhit (Bonf adjust)	<lowest dose	Dose1
Jonckheere	<lowest dose	Dose1

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE NH_LE (NumberHatched/LiveEmbryo (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.870	<.001	2.154	0.105	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	14	94.86	4.38	1.17	4.62	92.33, 97.39
Dose1	14	86.13	10.24	2.74	11.89	80.22, 92.05
Dose2	14	89.30	7.54	2.01	8.44	84.94, 93.65
Dose3	14	80.16	14.96	4.00	18.66	71.52, 88.80

Level	Median	Min	Max	%of Control (means)	%Reduction (means)
Ctrl	94.89	87.23	100.00	.	.
Dose1	90.48	58.82	95.45	90.80	9.20
Dose2	87.82	76.92	100.00	94.13	5.87
Dose3	82.91	36.84	100.00	84.50	15.50

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	15.46	0.001

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	94.89	.	.
Dose1	90.48	0.017	0.003
Dose2	87.82	0.082	0.017
Dose3	82.91	0.002	<.001

SUMMARY

MannWhit (Bonf adjust)

Jonckheere

NOAEC

<lowest dose

<lowest dose

LOAEC

Dose1

Dose1

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE HS (Hatching Survival(d14))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.982	0.518	2.298	0.087	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	34.07	18.32	4.73	53.78	23.92, 44.21
Dose1	16	28.38	17.73	4.43	62.50	18.92, 37.83
Dose2	15	27.60	12.65	3.27	45.83	20.60, 34.60
Dose3	16	16.56	11.37	2.84	68.66	10.50, 22.62

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	41.00	0.00	63.00	.	.
Dose1	29.00	0.00	58.00	83.29	16.71
Dose2	25.00	0.00	46.00	81.02	18.98
Dose3	16.00	0.00	44.00	48.62	51.38

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	58	3.57	0.019

Dunnett - testing each trt mean signif. less than control

Williams - test assumes dose-response relationship, testing negative trend

Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Dose1	Dose2	Tukey p-values		
							Dose3	Dose4	Dose5
Ctrl	34.07	.	34.07	.	0.730	0.656	0.012	.	.
Dose1	28.38	0.309	28.38	0.182	.	0.999	0.140	.	.
Dose2	27.60	0.264	27.60	0.160	.	.	0.198	.	.
Dose3	16.56	0.003	16.56	0.001	.	.	.	.	.

SUMMARY

Dunnett

Williams

NOAEC

Dose2

Dose2

LOAEC

Dose3

Dose3

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE HS_ES (HatchingSurvival/EggsSet (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.854	<.001	2.099	0.110	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	14	84.31	14.47	3.87	17.16	75.96, 92.66
Dose1	16	65.51	29.95	7.49	45.72	49.55, 81.47
Dose2	15	69.73	24.27	6.27	34.81	56.29, 83.17
Dose3	16	55.75	26.97	6.74	48.37	41.38, 70.12

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	86.46	38.46	100.00	.	.
Dose1	74.54	0.00	91.30	77.70	22.30
Dose2	71.43	0.00	94.12	82.70	17.30
Dose3	59.58	0.00	88.89	66.12	33.88

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	14.20	0.003

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	86.46	.	.
Dose1	74.54	0.031	0.007
Dose2	71.43	0.121	0.023
Dose3	59.58	0.002	<.001

SUMMARY

MannWhit (Bonf adjust)
Jonckheere

NOAEC

<lowest dose
<lowest dose

LOAEC

Dose1
Dose1

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE HS_NH (HatchingSurvival/NumberHatched (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.642	<.001	11.144	<.001	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	14	98.82	2.22	0.59	2.25	97.54, 100.00
Dose1	14	99.47	1.07	0.29	1.08	98.85, 100.00
Dose2	14	98.07	2.52	0.67	2.57	96.62, 99.53
Dose3	14	88.02	15.94	4.26	18.11	78.81, 97.22

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	100.00	92.59	100.00	.	.
Dose1	100.00	97.14	100.00	100.66	-0.66
Dose2	100.00	92.31	100.00	99.24	0.76
Dose3	92.58	44.44	100.00	89.07	10.93

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	15.77	0.001

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	100.00		
Dose1	100.00	1.000	0.737
Dose2	100.00	1.000	0.145
Dose3	92.58	0.012	<.001

SUMMARY

MannWhit (Bonf adjust)
Jonckheere

NOAEC

Dose2
Dose2

LOAEC

Dose3
Dose3

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE THICK (Eggshell thickness)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.599	<.001	1.510	0.221	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval	
Ctrl	15	0.35	0.10	0.03	28.64	0.30,	0.41
Dose1	16	0.38	0.03	0.01	8.21	0.36,	0.40
Dose2	15	0.37	0.02	0.01	5.42	0.36,	0.38
Dose3	16	0.35	0.03	0.01	9.08	0.33,	0.37

Level	Median	Min	Max	%of Control (means)	%Reduction (means)
Ctrl	0.37	0.00	0.45	.	.
Dose1	0.37	0.34	0.45	107.12	-7.12
Dose2	0.37	0.33	0.40	105.10	-5.10
Dose3	0.36	0.26	0.39	98.46	1.54

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups
Degrees of Freedom TestStat P-value
3 7.87 0.049

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	0.37	.	.
Dose1	0.37	1.000	0.578
Dose2	0.37	1.000	0.512
Dose3	0.36	0.067	0.015

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose2	Dose3

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE HATWT (Hatchling Weight)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.554	<.001	0.674	0.572	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	15	30.40	8.61	2.22	28.32	25.63, 35.17
Dose1	16	29.19	11.62	2.90	39.80	23.00, 35.38
Dose2	15	31.40	8.90	2.30	28.35	26.47, 36.33
Dose3	16	28.81	11.45	2.86	39.74	22.71, 34.91

Level	Median	Min	Max	% of Control (means)	% Reduction (means)
Ctrl	32.00	0.00	36.00	.	.
Dose1	33.00	0.00	38.00	96.01	3.99
Dose2	34.00	0.00	37.00	103.29	-3.29
Dose3	32.50	0.00	37.00	94.78	5.22

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups
Degrees of Freedom TestStat P-value
3 1.94 0.585

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	32.00		
Dose1	33.00	1.000	0.602
Dose2	34.00	1.000	0.895
Dose3	32.50	1.000	0.678

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE SURVWT (Survivor Wt (d14))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.625	<.001	0.546	0.653	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	277.07	79.72	20.58	28.77	232.92, 321.21
Dose1	16	256.31	102.64	25.66	40.04	201.62, 311.00
Dose2	15	259.13	78.46	20.26	30.28	215.68, 302.59
Dose3	16	234.19	95.23	23.81	40.67	183.44, 284.93

Level	Median	Min	Max	%of Control (means)	%Reduction (means)
Ctrl	300.00	0.00	346.00	.	.
Dose1	289.00	0.00	332.00	92.51	7.49
Dose2	281.00	0.00	329.00	93.53	6.47
Dose3	272.00	0.00	302.00	84.52	15.48

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	7.47	0.058

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	300.00		
Dose1	289.00	1.000	0.391
Dose2	281.00	0.358	0.125
Dose3	272.00	0.029	0.004

SUMMARY

MannWhit (Bonf adjust)
Jonckheere

NOAEC

Dose2
Dose2

LOAEC

Dose3
Dose3

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE FOOD (Food Consumption)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.938	0.004	1.043	0.381	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	135.73	27.53	7.11	20.28	120.49, 150.98
Dose1	16	145.06	22.14	5.53	15.26	133.27, 156.86
Dose2	15	136.40	16.89	4.36	12.39	127.04, 145.76
Dose3	16	133.63	19.88	4.97	14.88	123.03, 144.22

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	133.00	100.00	199.00	.	.
Dose1	139.50	111.00	195.00	106.87	-6.87
Dose2	133.00	115.00	180.00	100.49	-0.49
Dose3	128.50	102.00	171.00	98.45	1.55

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	3.26	0.353

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	133.00	.	.
Dose1	139.50	1.000	0.890
Dose2	133.00	1.000	0.607
Dose3	128.50	1.000	0.281

SUMMARY

MannWhit (Bonf adjust)
Jonckheere

NOAEC
Dose3
Dose3

LOAEC
>highest dose
>highest dose

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE WTGAINM (Male wt gain)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.977	0.311	1.740	0.169	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	15	-6.47	73.48	18.97	-1136.28	-47.16, 34.23
Dose1	16	-36.50	111.00	27.75	-304.11	-95.65, 22.65
Dose2	15	7.60	76.04	19.63	1000.58	-34.51, 49.71
Dose3	16	-16.56	106.70	26.68	-644.23	-73.42, 40.29

Level	Median	Min	Max	% of Control (means)	% Reduction (means)
Ctrl	10.00	-152.00	114.00	.	.
Dose1	-18.00	-218.00	195.00	564.43	-464.43
Dose2	12.00	-191.00	88.00	-117.53	217.53
Dose3	3.00	-249.00	116.00	256.12	-156.12

PARAMETRIC ANALYSES

- use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	58	0.61	0.614

Dunnett - testing each trt mean signif. less than control

Williams - test assumes dose-response relationship, testing negative trend

Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Dose1	Dose2	Tukey p-values Dose3	Dose4	Dose5
Ctrl	-6.47	.	-6.47	.	0.810	0.977	0.991	.	.
Dose1	-36.50	0.368	-15.16	0.472	.	0.563	0.932	.	.
Dose2	7.60	0.871	-15.16	0.504	.	.	0.891	.	.
Dose3	-16.56	0.628	-16.56	0.500	.	.	.	.	.

SUMMARY

Dunnett

Williams

NOAEC

Dose3

Dose3

LOAEC

>highest dose

>highest dose

Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

Mallard repro, Metaldehyde, MRID 42867902

ANALYSIS RESULTS FOR VARIABLE WTGAINF (Female wt gain)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.721	<.001	1.036	0.383	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	104.73	260.81	67.34	249.02	-39.70, 249.16
Dose1	16	14.50	89.20	22.30	615.17	-33.03, 62.03
Dose2	15	59.40	86.69	22.38	145.94	11.39, 107.41
Dose3	16	36.75	127.46	31.86	346.82	-31.17, 104.67

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	71.00	-93.00	1007.00	.	
Dose1	12.00	-182.00	224.00	13.84	86.16
Dose2	42.00	-84.00	198.00	56.72	43.28
Dose3	16.00	-155.00	301.00	35.09	64.91

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	1.90	0.593

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	71.00	.	.
Dose1	12.00	0.334	0.103
Dose2	42.00	1.000	0.508
Dose3	16.00	1.000	0.428

SUMMARY

MannWhit (Bonf adjust)
Jonckheere

NOAEC

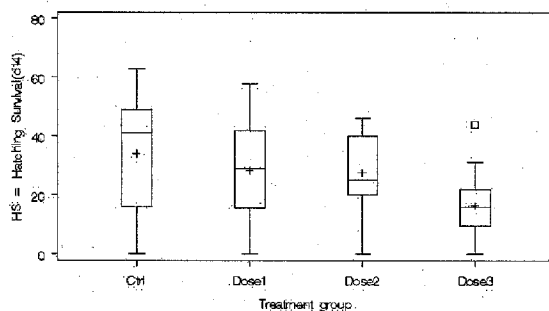
Dose3
Dose3

LOAEC

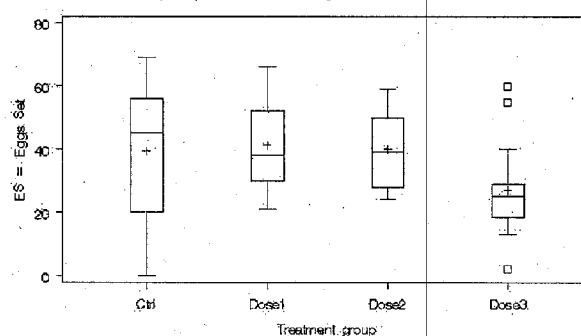
>highest dose
>highest dose

Box Plots:

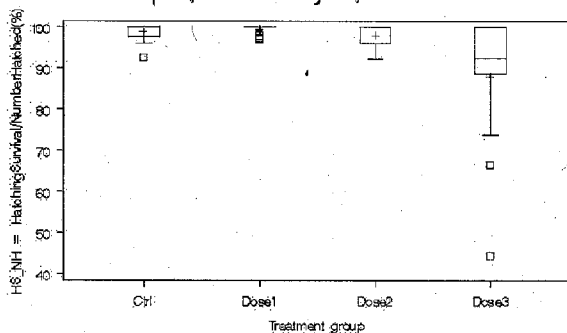
Mallard repro, Metaldehyde, MRID 42867902



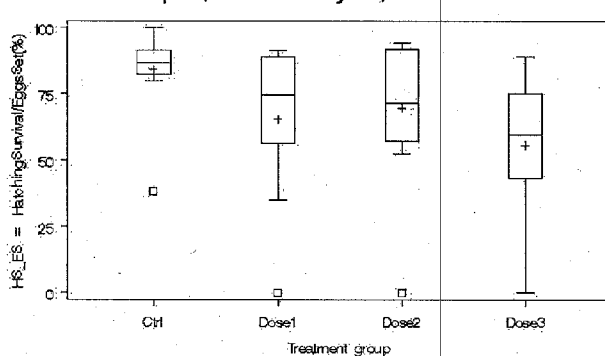
Mallard repro, Metaldehyde, MRID 42867902



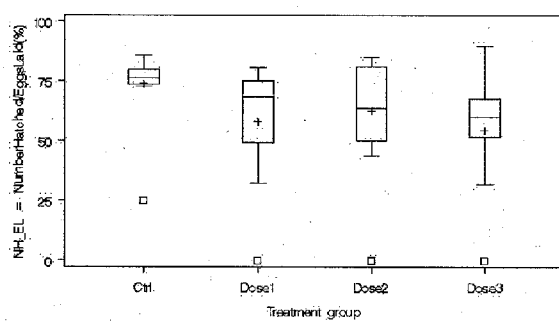
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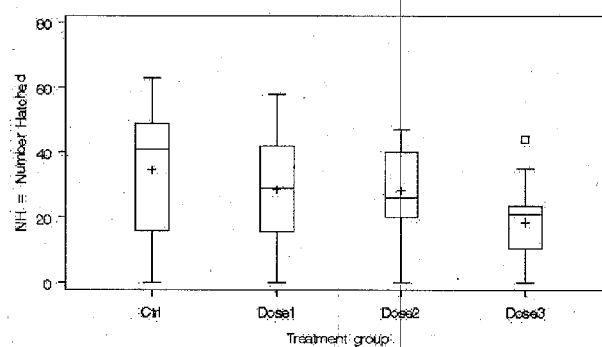
Mallard repro, Metaldehyde, MRID 42867902



Mallard repro, Metaldehyde, MRID 42867902



Mallard repro, Metaldehyde, MRID 42867902

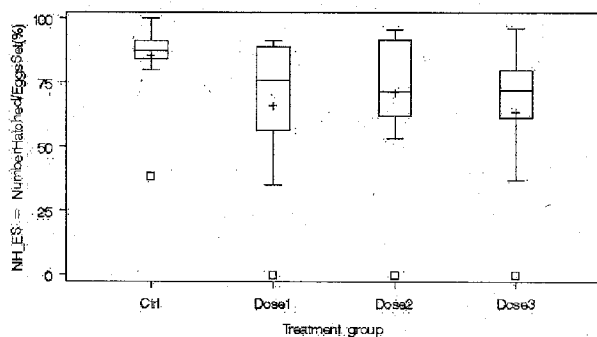


Data Evaluation Report on the Reproductive Effects of Metaldehyde Technical on Mallard Duck, *Anas platyrhynchos*

PMRA Submission Number

EPA MRID Number 42867902

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